Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	180	low with fuel with alarm	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/24 16:06
L2	0	low with fuel with alarm same refill	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/24 16:06
L3	6	low with fuel with alarm same delivery	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/24 16:07
L4	2	low with fuel with alarm same fill	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/24 16:07
L5	4	low with fuel with alarm and refill	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/24 16:07
S1	98	(determin$4 measur$4 sens$4) with flow with (gas gaseous) with fuel and remain$4 with fuel with tank	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/24 12:56
S2	37	(determin$4 measur$4 sens$4) with flow with (gas gaseous) with fuel with (supply feed in input) and remain$4 with fuel with tank	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 13:31
S3	11	(determin$4 measur$4 sens$4) with flow with (gas gaseous) with fuel with (supply feed in input) and remain$4 with fuel with tank and volume	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 13:33
S4	12	(determin$4 measur$4 sens$4) with flow with (gas gaseous) with fuel with (supply feed in input output) and remain$4 with fuel with tank and volume	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 13:34
S5	11	(determin$4 measur$4 sens$4) with flow with (gas gaseous) with fuel with (supply feed input output) and remain$4 with fuel with tank and volume	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 13:34
S6	10	(determin$4 measur$4 sens$4) with flow with (gas gaseous) with fuel with (supply feed input output) and (remains remaining) with fuel with tank and volume	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 13:35

S7	14	(determin$4 measur$4 sens$4) with flow with (gas gaseous) with fuel with (supply feed input output inlet outlet) and (remains remaining) with fuel with tank and volume	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 13:37
S8	23	(determin$4 measur$4 sens$4) with flow with (gas gaseous) with (supply feed input output inlet outlet) and (remains remaining) with fuel with tank and volume	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 13:48
S9	1	expended near volume same flow with rate with gas	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 13:38
S10	2480680	liquid near fuel same deliver$4 (gas gaseous)	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 13:48
S11	851	liquid near fuel same deliver$4 with (gas gaseous)	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 13:48
S12	106	liquid near fuel same deliver$4 with (gas gaseous) and (measur$4 determin$4 sens$4) with flow with (gas gaseous)	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 13:49
S13	13	liquid near fuel same deliver$4 with (gas gaseous) and (measur$4 determin$4 sens$4) with flow with (gas gaseous) and remain$4 with (tank drum)	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 13:50
S14	15	liquid near (fuel propane) same deliver$4 with (gas gaseous) and (measur$4 determin$4 sens$4) with flow with (gas gaseous) and remain$4 with (tank drum)	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 13:50
S15	24	liquid near (fuel propane) same deliver$4 with (gas gaseous) and (measur$4 determin$4 sens$4) with flow with (gas gaseous) and remain$4 with (tank drum container supply storage)	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 13:51
S16	16	liquid near (fuel propane) same deliver$4 with (gas gaseous) and (measur$4 determin$4 sens$4) with flow with (gas gaseous) and remain$4 with (tank drum container supply storage) and volume	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 13:55

S17	25	flow with sensor with outlet and volume and fuel with remain$4 with (tank container)	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 13:56
S18	25	flow with sensor with outlet with (measur$4 determin$4 sens$4) and volume and fuel with remain$4 with (tank container)	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 13:59
S19	9	flow with sensor with outlet with (measur$4 determin$4) and volume and fuel with remain$4 with (tank container)	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 13:59
S20	10	flow with sensor with outlet with (measur$4 determin$4 sense senses) and volume and fuel with remain$4 with (tank container)	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 14:32
S21	10	flow with sensor with outlet with (measur$4 determin$4 sense senses) and volume and fuel with remain$4 with (tank container canister)	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 14:31
S22	302	flow with rate with outlet with (tank canister container) and volume and remain$4 with (tank canister container)	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 14:33
S23	25	flow with rate with outlet with (tank canister container) and volume and remain$4 with (tank canister container) with fuel	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 14:36
S24	13	flow with rate with outlet with (tank canister container) with (vapor gas gaseous) and volume and remain$4 with (tank canister container) with fuel	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 14:38
S25	7	flow with rate with inlet with (tank canister container) with (vapor gas gaseous) and volume and remain$4 with (tank canister container) with fuel	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 14:39
S26	8	flow with rate with supply with (tank canister container) with (vapor gas gaseous) and volume and remain$4 with (tank canister container) with fuel	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 14:41
S27	2	flow with rate with feed with (tank canister container) with (vapor gas gaseous) and volume and remain$4 with (tank canister container) with fuel	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 14:41

S28	867	flow with rate with outwith (tank canister container) with (vapor gas gaseous) and volume and remain$4 with (tank canister container) with fuel	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 14:41
S29	8	flow with rate with out with (tank canister container) with (vapor gas gaseous) and volume and remain$4 with (tank canister container) with fuel	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 14:42
S30	56	flow with rate with (out outlet inlet supply feed) with (tank canister container) with (vapor gas gaseous) and volume with (tank canister container) with fuel	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/09 14:43
S31	14	flow with rate with (gas gaseous) with fuel and liquid with fuel with remain$4 with tank	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/24 12:57
S32	45	flow with rate with (gas gaseous vapor) with fuel and liquid with fuel with remain$4 with tank	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/24 13:00
S33	9	(determin$4 measur$4 sens$4) with flow with rate with (gas gaseous vapor) with fuel and liquid with fuel with remain$4 with tank	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/24 13:05
S34	11	(determin$4 measur$4 sens$4) with flow with rate with (gas gaseous vapor) and liquid with fuel with remain$4 with tank	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/24 13:06
S35	49	(determin$4 measur$4 sens$4) with flow with rate with (gas gaseous vapor) and amount with fuel with remain$4 with tank	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/24 14:13
S36	9	(determin$4 measur$4 sens$4) with flow with rate with (gas gaseous vapor) and volume with fuel with remain$4 with tank	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/24 13:06
S37	239	(fuel gas) with remain$4 with tank same flow with rate	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/24 14:14
S38	27	(fuel gas) with remain$4 with tank same flow with rate same volume	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2005/05/24 16:06
S39	1	2000-370300.NRAN.	DERWENT	OR	OFF	2005/05/24 14:17

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the remaining fuel metering device which measures the residue of the liquid fuel left behind in the fuel tank with a sufficient precision.
[0002]
[Description of the Prior Art] Conventionally, as shown in drawing 7 , in the fuel tank 101 carried in the automobile, one or more fuel pumps 105 which feed the liquid fuel in a fuel tank 101 (for example, gasoline) to the fuel branch pipe 104 with which the engine 102 was equipped with two or more fuel injection valves (injector) 103 which inject liquid fuel are arranged. And according to the operational status of an engine 102, as for two or more injectors 103 and fuel pumps 105, automatic control of the supply pressure of liquid fuel, injection quantity, fuel injection timing of liquid fuel, etc. is carried out with the engine ECU 106.
[0003] Here, conventionally, the crew of an automobile looked at the remaining fuel meter (fuel meter) 111 as a vision display means to display the residue of the liquid fuel measured by the remaining fuel metering device 100, and recognizes the residue of the liquid fuel in a fuel tank 101. That remaining fuel metering device 100 is equipped with the level gauge 107 allotted one or more pieces according to the configuration of a fuel tank 101, and it is constituted so that the fuel meter 111 may display the residue of liquid fuel according to the electrical signal from this level gauge 107.
[0004] In addition, the sliding friction prepared in a level gauge 107 is connected with the float 108 which moves by change of the oil level of the liquid fuel in a fuel tank 101 through the float arm 109, and it is constituted so that an electric resistance value may change with migration of float 108.
[0005]
[Problem(s) to be Solved by the Invention] However, the configuration of a fuel tank 101 is in the inclination which carries out flattening, or is complicated as shown in drawing 7 from the constraint on loading to an automobile in recent years. Consequently, in the conventional remaining fuel metering device 100, the problem of falling very much to that to which the measurement precision of the residue of the liquid fuel which remains in the fuel tank 101 measures the residue of the liquid fuel in the fuel tank of a simple configuration has arisen.
[0006] Moreover, when the configuration of a fuel tank 101 is complicated, as shown in drawing 7 , it is necessary to install a level gauge 107 in the two or more piece fuel tank 101. And if the configuration of a fuel tank 101 is complicated further, it is necessary to make the number of a level gauge 107 increase further. Consequently, when the components mark of the component part which constitutes the remaining fuel metering device 100 increase further, it is apprehensive about the increment in the product price of the remaining fuel metering device 100.
[0007] The configuration of a fuel tank 101 becomes very more difficult [it / flattening or to install a level gauge 107 in the fuel tank 101] still, if complicated, and it becomes impossible and to measure the residue of the liquid fuel in a fuel tank 101. Consequently, the appearance of the remaining fuel metering device which can measure the residue of the liquid fuel in a fuel tank 101 is expected, without

using a level gauge 107.
[0008]
[Objects of the Invention] The purpose of this invention is to offer the remaining fuel metering device which can measure the residue of the liquid fuel left behind in the fuel tank, without using the sensor which detects the liquid level change of liquid fuel, such as a level gauge. Moreover, the configuration of a fuel tank is to offer the remaining fuel metering device which can measure flattening or the residue of liquid fuel left behind in the fuel tank even if complicated with a sufficient precision.
[0009]
[Means for Solving the Problem] According to claim 1 and invention according to claim 2, when it detects that oil supply into a fuel tank was completed, by starting actuation of a pump, air is sent in in a fuel tank and tank internal pressure rises. And actuation of a pump is suspended when the tank internal pressure detected with a tank internal pressure detection means reaches a set pressure. At this time, the tank space volume which is the space capacity in a fuel tank is computed based on the amount of pump discharges and elapsed time after starting actuation of a pump until tank internal pressure reaches a set pressure.
[0010] And the residue of the liquid fuel in a fuel tank can be measured by computing the residue of the liquid fuel left behind in the fuel tank based on this computed tank space volume, without using the sensor which detects the liquid level change of liquid fuel, such as a level gauge. moreover -- temporary -- the configuration of a fuel tank -- flattening -- or since it is not necessary to install sensors, such as a level gauge, in a fuel tank and he is trying to compute the residue of the liquid fuel in a fuel tank by the operation even if complicated, the residue of the liquid fuel in a fuel tank is measurable with a sufficient precision.
[0011] When computing the residue of the liquid fuel left behind in the fuel tank by the remaining fuel operation means according to invention according to claim 3, the residue of the liquid fuel left behind in the fuel tank can be measured with a sufficient precision by also taking into consideration the injection quantity of the liquid fuel computed with the injection-quantity operation means, and computing the residue of liquid fuel by the operation.
[0012] Since according to invention according to claim 4 a remaining fuel metering device can be constituted only from adding a pump to the existing evaporation fuel processing unit by operating a pump and sending in air in a fuel tank through a canister and the communicating tube when purge piping is closed by the closing motion valve, there are very few increments in components mark.
[0013] When computing the residue of the liquid fuel left behind in the fuel tank by the remaining fuel operation means according to invention according to claim 5, the residue of the liquid fuel left behind in the fuel tank can be measured with a sufficient precision by also taking into consideration the amount of purges of the evaporation fuel computed with the amount operation means of purges, and computing the residue of liquid fuel by the operation.
[0014]
[Embodiment of the Invention] [Configuration of an operation gestalt] The gestalt of implementation of invention is explained with reference to a drawing based on an example. Here, drawing 1 is drawing having shown the fuel pipe line of an automobile.
[0015] The fuel tank 2 which is in arrears with the liquid fuel which supplies the automotive fuel residue metering device of this example to the gasoline engine (it abbreviates to an engine below) 1 as an internal combustion engine, The fuel injection equipment 4 which injects liquid fuel (for example, high volatilization fuels, such as a gasoline) in the inlet pipe (intake manifold) 3 of an engine 1, It has the evaporation fuel processing unit 5 which processes the evaporation fuel which volatilized in the fuel tank 2, and the engine control system (it is called Engine ECU below) 9 which carries out electronics control of a fuel tank 2, a fuel injection equipment 4, and the evaporation fuel processing unit 5.
[0016] First, the engine 1 of this example is briefly explained based on drawing 1 . The engine 1 is carried in the engine room of an automobile. In the inlet pipe 3 of this engine 1, the throttle valve 10 which it interlocks and carries out a switching action to an accelerator pedal (not shown) is incorporated free [rotation]. Moreover, the inlet pipe 3 of an engine 1 is connected to the combustion chamber (not

shown) formed between the cylinder of an engine 1, and a piston. The combustion chamber is connected with the exhaust pipe 11 for discharging exhaust gas.

[0017] Next, the fuel tank 2 of this example is briefly explained based on drawing 1 . A fuel tank 2 is carried in the rear seat bottom of an automobile, the interior divides, and it is divided through the section 12 at two fuel reservoir rooms 13 and 14, and is a resin tank which a tank configuration is a flat configuration and was complicated. And it is prepared in the side of a fuel tank 2 so that the filler neck 16 of the approximate circle tubing configuration which forms the fuel oil supply path 15 in the interior may be prolonged in the slanting upper part from the fuel reservoir room 13. The oil supply port for supplying liquid fuel with oil in a fuel tank 2 is formed at the tip of the filler neck 16. The oil supply port is blockaded after oil supply by fastening a filler cap 17 at the tip of a filler neck 16.

[0018] Next, the fuel injection equipment 4 of this example is briefly explained based on drawing 1 . This fuel injection equipment 4 consists of fuel line 24 grades which form the above-mentioned fuel tank 2, the fuel pump 21 which carries out pressurization supply of the liquid fuel in this fuel tank 2 at an inlet pipe 3, the fuel branch pipe 22 formed in the inlet pipe 3 of an engine 1, two or more fuel injection valves (injector) 23 inserted into this fuel branch pipe 22, and the fuel path which opens a fuel pump 21 and the fuel branch pipe 22 for free passage.

[0019] A fuel pump 21 sucks up liquid fuel from a fuel tank 2, feeds it to the fuel branch pipe 22, and is driven by electric actuators, such as an electric motor to which electronics control of the applied voltage is carried out with an engine ECU 9. Moreover, the fuel branch pipe 22 does not distribute the liquid fuel fed from the fuel pump 21 to each injector 23, and the return path (not shown) for returning the liquid fuel which was not used with each injector 23 to a fuel tank 2 is connected. And an injector 23 is held in the fuel branch pipe 22, and atomizes and injects liquid fuel directly into the inhalation port of an inlet pipe 3 based on the injection signal from an engine ECU 9.

[0020] Next, the evaporation fuel processing unit 5 of this example is briefly explained based on drawing 1 R> 1. The canister 30 which this evaporation fuel processing unit 5 adsorbs the evaporation fuel (evaporated gas) which volatilized in the fuel tank 2, and is stored, The two communicating tubes 33 and 34 which open for free passage two purge points 31 and 32 formed in the head-lining part of a fuel tank 2, and canisters 30, It has the purge piping 35 which forms the purge path which opens a canister 30 and the inlet pipe 3 of an engine 1 for free passage, and the solenoid valve 36 formed in the middle of this purge piping 35.

[0021] In the canister 30, the adsorbent (for example, activated carbon etc.) which adsorbs an evaporation fuel is contained. Moreover, the atmospheric-air hole 37 wide opened by atmospheric air is formed in a canister 30, and it constitutes exterior air possible [inhalation] inside. The atmospheric-air hole 37 blockades the atmospheric-air hole 37, and the canister control valve 42 for opening a pump 6 for free passage is attached. Moreover, if a solenoid valve 36 is energized with an engine ECU 9, it will open, and the closing motion valve which will be closed if energization is stopped by the engine ECU 9 is used. In addition, 38 and 39 are the float valves for making it liquid fuel not permeate into the evaporation fuel processing unit 5 from two purge points 31 and 32, when an automobile passes through a slope or a slant face and the oil level of the liquid fuel in a fuel tank 2 inclines.

[0022] And an automotive fuel residue metering device drives the fuel meter 7 based on the residue of the liquid fuel computed in the pump 6 which supplies air in a fuel tank 2, the remaining fuel meter (it is called fuel meter below) 7 which displays the residue of liquid fuel, the control circuit 8 which computes the residue of the liquid fuel left behind in the fuel tank 2 by the operation, and this control circuit 8. Two-way communication (serial communication) of the control circuit 8 is carried out to an engine ECU 9.

[0023] A pump 6 is an electromotive air pump which sends in air in a fuel tank 2 through the canister 30 and the communicating tubes 33 and 34 of the evaporation fuel processing unit 5 until the tank internal pressure in a fuel tank 2 reaches more than a set pressure from the time of being prepared in the middle of pneumatic piping 40 which is open for free passage inside a canister 30, and oil supply into a fuel tank 2 being completed. This pump 6 is driven by electric actuators, such as an electric motor by which electronics control is carried out with an engine ECU 9.

[0024] And the air filter 41 which filters the inhaled air is formed in pneumatic piping 40 of the air upstream rather than the pump 6. The fuel meter 7 is the analog meter or digital meter which constitutes the receiver section of an automotive fuel residue meter, and is a remaining fuel display means which indicates the residue of the liquid fuel left behind in the fuel tank 2 by vision with the design of the instrument panel with which the instrument panel of an automobile was equipped.
[0025] Next, the control circuit 8 of this example is briefly explained based on drawing 1 . A control circuit 8 is equivalent to the space volume operation means of this invention, and a remaining fuel operation means, is an electronic circuitry for remaining fuel instrumentation systems, and is the microcomputer which contained CPU, ROM, RAM, and a timer circuit in itself. And from a dc-battery (not shown), a power source is supplied and a control circuit 8 always operates.
[0026] This control circuit 8 measures the residue of the liquid fuel left behind in the fuel tank 2 based on the electrical signal inputted from the empty switch 43 and the engine ECU 9. And a control circuit 8 drives the fuel meter 7 based on the control program memorized beforehand to ROM.
[0027] An engine ECU 9 is the electronic circuitry for engine control systems which carries out electronics control of a fuel pump 21, an injector 23, and the fuel meter 7, and is the microcomputer which contained CPU, ROM, RAM, and a timer circuit in itself.
[0028] This engine ECU 9 inputs the lid switch 44 and a speed sensor 45, and the detecting signal that detects the operational status of an engine 1 further from each sensor, such as an engine-speed sensor, a throttle opening sensor, an inspired-air-volume sensor, a cooling coolant temperature sensor, and an oxygen sensor (neither is illustrated).
[0029] The empty switch 43 is equivalent to a minimum residue detection means to output an electrical signal, when the residue of the liquid fuel in a fuel tank 2 is below a lower limit (for example, 5l.). If a thermistor is used as an empty switch 43 and the liquid fuel in a fuel tank 2 specifically becomes below a lower limit, when a thermistor is exposed from liquid fuel and the temperature of a thermistor rises, the electric resistance value of a thermistor will become small.
[0030] Therefore, after supplying liquid fuel with oil, it is detectable by detecting the time of the electric resistance value of a thermistor becoming small at the beginning that the residue of the liquid fuel in a fuel tank 2 became below a lower limit. In addition, since the current which flows an electrical circuit will increase if the electric resistance value of a thermistor becomes small when the empty lamp (not shown) is formed in the FEERU meter 7, an empty lamp lights up.
[0031] The lid switch 44 is formed near the oil supply port of a filler neck 16, and it corresponds by turning off, if a filler cap 17 is removed (OFF) to an oil supply initiation detection means to a fuel tank 2 to detect initiation of oil supply, and when a filler cap 17 is fastened at the tip of a filler neck 16, it corresponds by turning on (ON) to a completion detection means of oil supply to a fuel tank 2 to detect completion of oil supply. Moreover, a speed sensor 45 is equivalent to a vehicle speed detection means to detect the rate (vehicle speed) of an automobile.
[0032] The [measurement approach of an example] Next, the remaining fuel measurement approach by the control circuit 8 of this example is briefly explained based on drawing 1 thru/or drawing 6 . Here, drawing 2 and drawing 3 are the flow charts which showed the control circuit 8 and the remaining fuel measurement approach with an engine ECU 9.
[0033] First, it judges whether the vehicle speed of the automobile detected with the speed sensor 45 is below the predetermined vehicle speed. Specifically, it judges whether the vehicle speed of an automobile is 0 km/h that is, and an automobile is stopping (step S1). When this judgment result is NO (i.e., when an automobile is running), it shifts to control processing of step S15.
[0034] Moreover, when the judgment result of step S1 is YES (i.e., when an automobile is stopping), it judges whether the lid switch 44 formed near the oil supply port of a filler neck 16 turns on. That is, it judges whether completion of an oil supply activity into a fuel tank 2 is detected (step S2). When this judgment result is NO, it shifts to control processing of step S15.
[0035] moreover, when the judgment result of step S2 is YES namely, when the oil supply activity into the fuel tank 2, such as fastening the filler cap 17 once removed for oil supply at the tip of a filler neck 16, is completed Air is pushed in in a fuel tank 2 through the canister 30 and the communicating tubes

33 and 34 of the evaporation fuel processing unit 5 by closing a solenoid valve 36, switching the canister control valve 42, and starting actuation of a pump 6 (starting, ON) (step S3). Next, a timer circuit is started (step S4).
[0036] Next, as shown in the timing diagram of drawing 4 (b), tank internal pressure (P) rises with time amount progress by air pushing of a pump 6. In connection with this, as shown in the timing diagram of drawing 4 (a), the pump current (I) supplied to a pump 6 goes up. For this reason, the pump current (I) of a pump 6 is incorporated (step S5).
[0037] Next, the amount of pump discharges (Q) which is an air content which the tank internal pressure (P) and the pump 6 which are the internal pressure of a fuel tank 2 breathed out is computed by being based on the property Fig. of the pump current (I) incorporated at step S5, and drawing 5 (step S6). Next, the elapsed time which has passed after starting the timer circuit is read (step S7).
[0038] Next, after starting actuation of a pump 6 and starting the elapsed time to current, i.e., measurement of a pump current, based on the several 1 following formula, measurement time amount (unit time amount: TFUEL) to current is computed (step S8). (updating)
[Equation 1] TFUEL=T-TFUEL -- here, T is elapsed time and TFUEL is measurement time amount.
[0039] Next, based on the several 2 following formula, the sum total pushing air content (VP) into a fuel tank 2 is computed (step S9). (updating)
[Equation 2] VP=VP+QxTFUEL -- here, the amount of pump discharges which computed Q at step S6, and TFUEL are the measurement time amount computed at step S8.
[0040] Next, it judges whether tank internal pressure (P) is beyond the set point (setting-pressure :P2.). That is, it judges whether a pump current (I) is beyond the set point (programmed current: IP2) (step S10). When this judgment result is NO, it shifts to control processing of step S5.
[0041] Moreover, when the judgment result of step S10 is YES (i.e., when tank internal pressure (P) reaches a setting pressure (P2)), pushing of the air into a fuel tank 2 is ended by suspending actuation of a pump 6 (OFF) (step S11).
[0042] Next, based on the several 3 following formula, the tank space volume (VAIR) which is the space capacity in a fuel tank 2 is computed (step S12).
[Equation 3] VAIR=P1xVP/(P2-P1)
It is the sum total pushing air content which atmospheric pressure and P2 computed P1, and computed a setting pressure and VP by step S9 here.
[0043] In addition, the tank space volume (VAIR) which is the space capacity in a fuel tank 2 tends to be influenced of the tank internal pressure before pressurization initiation, as shown in the graph of drawing 6 . That is, once it removes a filler cap 17, tank internal pressure will be set to P1 (atmospheric pressure), and tank internal pressure changes as time amount will pass after that, if a filler cap 17 is fastened at the tip of a filler neck 16. For this reason, the tank internal pressure before pressurization initiation changes from atmospheric pressure, and the error (L) of the calculated value of the tank space volume (VAIR) becomes large. Therefore, it is good to compute the tank space volume (VAIR) for a short time (between [for / 30 seconds / -] TFUEL:, for example, 150 seconds).
[0044] Next, since a fuel tank 2 is a resin tank, if temperature becomes high, it will elongation-come to be easy, and it will be easy to spread if tank internal pressure becomes large. For this reason, based on the several 4 following formula, tank capacity (VTANK) which is all the inner capacity of a fuel tank 2 is computed (step S13). (updating)
[Equation 4] VTANK=VTANK+VTEMP+VP2 -- here, the tank [VTEMP] expansion correction value according to temperature and VP2 are the tank expansion correction value according to a pressure.
[0045] Next, based on the several 5 following formula, the residue (FLVEL) of the liquid fuel left behind in the fuel tank 2 is computed (the remaining-fuel [1st] operation means: step S14).
[Equation 5] FLVEL=Nx (VTANK- (VAIR-VCAN))
Here, the piping canister volume and N of the tank space volume and VCAN which computed VAIR at step S12 are transform coefficients.
[0046] Based on the several 6 following formula, the injection quantity (FINJ) of the liquid fuel injected in the inlet pipe 3 of an engine 1 from two or more injectors 23 is computed (injection-quantity

operation means: step S15). In addition, the injection quantity (fuel consumption) of liquid fuel forms a sensor etc., and the actual injection quantity may be measured or it may compute it from an air-fuel ratio.
[0047]
[Equation 6] FINJ=KxNExTAU -- here, NE is [an injection pulse and K of an engine speed and TAU] transform coefficients.
[0048] And a part will volatilize and the liquid fuel with which it was left behind in the fuel tank 2 will turn into an evaporation fuel, if a fuel tank 2 is elevated-temperature-ized. Then, based on the several 7 following formula, the evaporation fuel which volatilized in the fuel tank 2 computes the amount (FPRG) of purges of the evaporation fuel purged by inlet-pipe negative pressure in an inlet pipe 3 (under valve opening of a solenoid valve 36) (the amount operation means of purges: step S16). In addition, the amount of purges of an evaporation fuel may form a sensor etc., and may measure the actual amount of purges.
[0049]
[Equation 7] FPRG=CxDPRGxQPRG -- here, DPRG is [the amount of volatilization from liquid fuel (the amount of purge gas) and C of the concentration (purge gas concentration) of an evaporation fuel and QPRG] transform coefficients.
[0050] Next, the residue (FLVL) of liquid fuel is computed based on the several 8 following formula. That is, what subtracted the amount (FPRG) of purges of the evaporation fuel computed at the injection quantity (FINJ) and step S16 of liquid fuel which were computed at step S15 from the residue (FLVL) of the liquid fuel computed at step S14 is made into the residue (FLVL) of current liquid fuel, and storage is updated (the remaining-fuel [2nd] operation means: step S17). In addition, the operation of step S14 and the operation of step S17 may be performed at once.
[Equation 8] FLVL=FLVL-(FINJ+FPRG)
[0051] Next, the empty (E points) switch 43 judges whether the electric resistance value of a thermistor became small to ON (ON), i.e., the beginning, (step S18). When this judgment result is NO, the driving signal according to the residue of liquid fuel is outputted to the fuel meter 7 (step S19), and a return is carried out to it after that.
[0052] moreover, when the judgment result of step S18 is YES, it is amended and remembered that FLVL makes a lower limit (FLOW:, for example, 51.) into the residue (FLVL) of the present liquid fuel -- it updates (a remaining-fuel amendment means, a lower-limit amendment means: step S20). After that, it shifts to control processing of step S19.
[0053] [Effect of Example(s)] -- as mentioned above, the automotive fuel residue metering device of this example computes the tank space volume (VAIR) which is the space capacity in a fuel tank 2 by the operation based on the amount of pump discharges (Q) and elapsed time (T) after starting actuation of a pump 6 immediately after completing oil supply into a fuel tank 2 and starting actuation of the pump 6 until tank internal pressure (P) reaches a set pressure (P2).
[0054] And the residue of the liquid fuel in a fuel tank 2 can be measured by computing the residue (FLVEL) of the liquid fuel left behind in the fuel tank 2 by the operation based on this computed tank space volume (VAIR), without using the sensor which detects the liquid level change of liquid fuel, such as a level gauge.
[0055] moreover -- temporary -- the configuration of a fuel tank 2 -- flattening -- or since it is not necessary to install sensors, such as a level gauge, in a fuel tank 2 and he is trying to compute the residue of the liquid fuel in a fuel tank 2 by the operation even if complicated, the residue of the liquid fuel in a fuel tank 2 is measurable with a sufficient precision.
[0056] And since the injection quantity of the liquid fuel injected in an engine 1 from each injector 23 and the amount of purges which purged the evaporation fuel which volatilized in the fuel tank 2 in the inlet pipe 3 are also taken into consideration and he is trying to calculate the residue of the liquid fuel in a fuel tank 2 in case the residue of the liquid fuel left behind in the fuel tank 2 is computed, the residue of the liquid fuel in a fuel tank 2 can be measured with a still more sufficient precision.
[0057] And since a remaining fuel metering device can be constituted only from adding pneumatic

piping 40, an air filter 41, a check valve 42, and a pump 6 to the canister 30 of the existing evaporation fuel processing unit 5 by starting actuation of a pump 6 and sending in air in a fuel tank 2 through a canister 30 and the communicating tubes 33 and 34 when the purge piping 35 is closed with a solenoid valve 36, there are very few increments in components mark.

[0058] [Modification] In this example, although the example of the remaining fuel metering device of automobiles, such as a gasoline engine loading vehicle, was shown for this invention, this invention may be used for the remaining fuel metering device of automobiles, such as a diesel-power-plant loading vehicle, the aircraft, or a vessel. Moreover, this invention may be applied to the remaining fuel metering device of the internal combustion engine of a stationary type which drives a common generator the object for prevate power generation, or public. Although the fuel meter 7 as a vision display means which indicates the residue of the liquid fuel in a fuel tank 2 by vision was formed in this example, the speech generation device as an acoustic-sense display means which indicates the residue of the liquid fuel in a fuel tank 2 by the acoustic sense may be prepared.